parylene C coating. Four keys on parylene C keypads were cycled for about 10^6 cycles per key. These samples showed some degree of wrinkling in the parylene polymer coating at the corner portions of the key in the skirt region where maximum flexing was observed. The cycled keypad samples were subjected to a gasoline immersion test to determine if any change in barrier properties may be observed due to varying degrees of cycling. The initial absorption rates extracted from the tests are compared in Table 3.

TABLE 3

Number of Key Cycles (Parylene C coated keypads)	Initial Gasoline Absorption Rate (%Δ Wt./min)
No Cycling	0.019
10^5 Cycles	0.027
10^6 Cycles	0.053

The results of this showed that flexing of the coating reduces the barrier protection of the parylene polymer coating as indicated above in Table 3, but this reduction correlated with the localized swelling of the keypad when exposed to gasoline. Swelling was first observed at the corner portions of the individual cycled keys at both the flexible skirt region and the key top areas where contact with the plunger is made. It was determined that the estimated lifetime of a parylene N coating is greater than 10^7 key cycles, and the estimated parylene C lifetime was measured at about 10^6 key cycles.

What is claimed is:

1. A method for depositing a barrier coating on a polymeric substrate, the method comprising the steps of:
   depositing a first layer of parylene N on a clean surface portion of the polymeric substrate;
   depositing a second layer of parylene C over said first layer; and
   annealing by heat each layer in the presence of a vacuum or an inert atmosphere at an annealing temperature for a time sufficient to increase the degree of parylene crystallization and to improve the adherence of the parylene C layer on the substrate and its barrier properties.

2. The method of claim 1, wherein the annealing temperature is from about 80 to 220° C. and the time period is from about 12 to 100 hours.

3. The method of claim 2, wherein the annealing temperature is about 120° C. and the time period is about 48 hours.

4. The method of claim 1, wherein the first layer of parylene N has a thickness in the range of from about 0.0001" to 0.0005", and the second layer of parylene C has a thickness in the range from about 0.0002" to 0.002".

5. The method of claim 4, wherein the first layer of parylene N is about 0.00002" thick and the second layer of parylene C is about 0.0005" thick.

6. The method of claim 1, further comprising the step of shifting gradually the deposition of parylene N to parylene C on the substrate to form a graded interlayer of parylene N and parylene C between the first and second layers.

7. The method of claim 6, wherein the graded interlayer includes a thickness in the range of from about 0.00005" to 0.0005".

8. A method for depositing a barrier coating on a polymeric substrate, the method comprising the steps of:
   treating a surface portion of the polymeric substrate to remove any contaminants, said treating step comprising:

cleaning ultrasonically the substrate in a solution of detergent,

rinsing the substrate in deionized water,

rinsing the substrate in methanol,

drying the substrate in an oven at a temperature of about 80° C. for at least one hour, and

blowing off the substrate with deionized nitrogen gas;

depositing at least one layer of a parylene polymer on the surface of the polymeric substrate via chemical vapor deposition; and

annealing by heat each deposited layer of the parylene polymer in the presence of a vacuum at an annealing temperature for a time sufficient to increase the degree of parylene crystallization.

9. The method of claim 8, wherein said depositing step comprises depositing a first layer of parylene N on the surface of said substrate and a second layer of parylene C over said first layer of parylene N.

10. The method of claim 8, wherein said depositing step further comprises gradually shifting the deposition of parylene N to paralyne C so as to form a graded interlayer of parylene N and parylene C between the first and second layers.

11. A method for depositing a barrier coating on a clean elastomeric surface, the method comprising the steps of:

exposing the surface to parylene N in vapor phase to form a first layer of parylene N polymer;

shifting the exposure of said parylene N to parylene C in vapor phase upon reaching a desired thickness of the first layer to form a graded layer comprising a transitional mixture or parylene N and parylene C; and

exposing the elastomeric surface to parylene C in vapor form in the absence of parylene N to form a third layer of parylene C polymer on said graded interlayer.

12. The method of claim 11, further comprising heating the resulting layers of parylene polymers to a temperature sufficient for annealing the parylene polymers in the presence of a vacuum; and

maintaining the annealing temperature on the parylene polymer layers for a sufficient annealing time period to increase the degree of parylene crystallization and to improve the adherence capability of the parylene layers to the elastomeric surface.

* * * * *

13. A method for depositing a barrier coating on a surface to protect an underlying substrate, the method comprising the steps of

depositing a first layer of a first parylene polymer on a clean surface portion of the substrate;

depositing a second layer of a second parylene polymer different from said first parylene polymer over said first layer; and

annealing by heating each layer in the presence of a vacuum or an inert atmosphere at an annealing temperature and for a time sufficient to increase the degree of parylene crystallization and to improve the adherence of the first parylene layer on the substrate and its barrier properties.

14. The method of claim 13 wherein said second parylene polymer is parylene C.

15. The method of claim 13 further comprising causing an adhesion promoting layer on the surface prior to depositing said first layer thereon.

16. A method for depositing a barrier coasting on a surface to protect an underlying substrate, the method comprising the steps of:

exposing the surface to a first parylene polymer in vapor phase to form a first layer of said first parylene polymer,

shifting the exposure of said first parylene polymer to a second parylene polymer in vapor phase upon reaching a desired thickness of said first layer to form a transition layer comprising a mixture of said first and said second parylene polymers, said second parylene polymer being a different parylene polymer than said first parylene polymer, and

exposing said graded layer to said second parylene polymer in vapor form in the absence of said first parylene polymer to form a third layer of said second parylene polymer on said graded layer.

17. The method of claim 16 wherein said transition layer is a graded layer of said first and second parylene polymers.

18. The method of claim 17 wherein said second parylene polymer is parylene C.

19. The method of claim 18 further comprising causing an adhesion promoting layer on the surface prior to exposing the surface to said first parylene polymer

20. The method of claim 16 further comprising heating the resulting layers of parylene polymers to a temperature sufficient for annealing the parylene polymers in the presence of a vacuum or an inert atmosphere including maintaining the annealing temperature on the parylene polymer layers for a sufficient annealing time period to increase the degree of parylene crystallization and to improve the adherence of the parylene layers to the surface.